revisions and allowance of the application, the formal drawings will be suitably revised.

REMARKS

In order to place this application in better condition for a complete action on the merits, the specification has been suitably revised to correct informalities and to place it in better conformance with U.S. practice. Proposed revisions have been submitted to label boxes in Figs. 1, 3, 9 and 10 of the application drawings, and claims 1-26 have been amended in formal respects to improve the wording and bring them into better conformance with U.S. practice. Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached pages are captioned **VERSION WITH MARKINGS TO SHOWN CHANGES MADE**.

To obtain a fuller scope of coverage, new claims 27-32 have been added. Adequate support for the subject matter recited in these claims may be found in the specification as originally filed.

Early and favorable action on the merits are respectfully requested.

Respectfully submitted,

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MAILING CERTIFICATE

I hereby certify that this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to: Commissioner of Patents & Trademarks, Washington, D.C. 20231, on the date indicated below.

Bruce L. Adams
Attorney Name

____
Signature

January 8, 2003
Date

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Paragraph beginning at line 8 of page 1 has been amended as follows:

A proximity field optical microscope (light probe microscope) utilizing a proximity field light <u>emitted</u> from the <u>microscopic</u> [micro] optical aperture of a probe tip or a scattered light at a sharp tip is <u>a</u> known [as a] device <u>that is</u> capable of performing [an] optical observation with a high resolving power exceeding a restriction of the wavelength of [a] light. By using the light probe microscope, it is possible to observe an optical picture with [the] <u>a</u> resolving power exceeding an optical image which has been measured by using a conventional optical microscope and a highly sensitized camera and, at the same time, a surface shape can be observed as well.

Paragraph beginning at line 19 of page 1 has been amended as follows:

In the light probe microscope, it is necessary to detect a weak light such as scattered light and fluorescent <u>light</u> radiated from the sample surface adjoining the light field locally existing at the probe tip. However, in the

conventional light probe microscope, there are used a photomultiplier and an avalanche photodiode as a light detector.

Paragraph beginning at line 3 of page 2 has been amended as follows:

Since a feeble light is detected in the light probe microscope, [a] stray light is picked up in the photomultiplier whose light-intercepting face is large, so that [it considered] [that a] noise becomes high. For example, <u>where</u> [in case that the] light from a probe [whose] <u>having an</u> optical aperture <u>of</u> [is] 100 nm is converged by an objective lens [whose] <u>having a</u> magnification [is] <u>of</u> 100 times, a size corresponding to the aperture becomes 10 μm in a primary picture. In contrast to this, a size of the light-intercepting face of the photomultiplier is several mm to several tens <u>of</u> mm, so that a major region does not contribute to [a] detection, reacts with the stray light, and becomes a source of [generating] a dark count noise. In order to eliminate the stray light, it [is] <u>has been</u> considered to insert a pin hole to an image formation face, but it is a very difficult operation to align an optical axis of the feeble light <u>therewith</u>. On the other hand, in the avalanche photodiode, the light-intercepting face is as relatively small

as about 200 to 500 μm, so that it is not easily influenced by the stray light. However, also in this case, it is necessary to align the optical axis, so that a measuring operation becomes complex.

Paragraph beginning at line 14 of page 3 has been amended as follows:

That is, in the present invention, there has been realized a light probe microscope having a probe capable of generating light field locally existing in a tip portion, probe position detecting means for controlling a distance between a tip of the probe and a sample to an adjoining distance, tremor <u>or oscillating</u> means and control means, scan means for two-dimensionally scanning the probe on a sample surface, a light source for generating the locally existing light field, an optical system for converging a light radiated from the sample surface adjoining the probe tip, and data collecting means, characterized in that a two-dimensional image of the sample surface is obtained in real time by two-dimensional image snesor, and a two-dimensional light image is extracted simultaneously with a shape image by means of obtaining a signal intensity of an optional detection region in the two-dimensional image by picture signal processing means.

Paragraph beginning at line 6 of page 4 has been amended as follows:

Further, it becomes possible to selectively obtain a light signal of specified wavelength by disposing a spectroscope in a front stage of the two-dimensional image sensor. Besides, by means of [constituting] <u>constructing</u> the converging optical system [by] <u>with</u> an optical system containing a polarizer and a mirror, [it is] [adapted such that] different polarization components <u>can be made to</u> form images [respectively] in separate positions on the two-dimensional image snesor, and <u>either</u> [it is adapted such that the] polarization component [is] <u>can be</u> selectively detected. Similarly, by [means of constituting] <u>constructing</u> the converging optical system by an optical system containing a dichroic mirror and [a] <u>another</u> mirror, [it] [is adapted such that] different wavelength components <u>can be made to</u> form images [respectively] in separate positions on the two-dimensional image sensor, and <u>either</u> [it is adapted such that the] wavelength component [is] <u>can be</u> selectively detected. Here, [it is] [adapted such that] <u>a plurality of</u> the [detection] <u>detections</u> region [is] <u>are</u> simultaneously set [in plural number,] and plural light images can be simultaneously obtained. By this, it is made possible to observe plural light images without using plural detectors.

Paragraph beginning at line 4 of page 5 has been amended as follows:

Incidentally, in the picture signal processing means, [a] signal processing is performed by means of digitizing a video signal, calculating a light intensity of the detection region, and transmitting it to the data collecting means as a digital value intact or [by] after being converted into an analog value.

Paragraph beginning at line 14 of page 5 has been amended as follows:

Incidentally, according to [knowledges] knowledge of the present inventor, there is an example in which the two-dimensional image sensor is utilized as observing means in order to examine a scattered state of the light from the probe, but there is no example in which it is used as a light detector in a probe scanning time.

Paragraph beginning at line 21 of page 6 has been amended as follows:

Hereunder, [it is explained about] an embodiment of the present invention with reference [by referring] to the attached drawings.

Paragraph beginning at line 23 of page 6 has been amended as follows:

Fig. 1 shows one constitutional diagram of a light probe microscope of the present invention. In Fig. 1, it has a probe 11 having a light field locally existing in <u>the vicinity of</u> a tip portion <u>thereof</u>, probe position detecting means 12 for [controlling] <u>detecting</u> a distance between a tip of the probe 11 and a sample to an adjoining distance, tremor <u>or oscillating</u> means 13 and control means 14 <u>for controlling the distance between the probe tip 11 and the sample</u>, scan means 15 for two-dimensionally scanning the probe on a sample surface, a light source 16 for generating the light field locally existing <u>in the vicinity of the probe tip</u>, an optical system 17 for converging a light radiated from a sample 21 surfaces adjoining a probe 11 tip, and data collecting means 18, and further has a two-dimensional image sensor 19, and picture signal processing means 20. Here, a two-dimensional image on the sample 21 surface is obtained in real time by the two-dimensional image sensor 19, and it is made possible to <u>optionally</u> obtain a signal strength of [an optional] <u>a</u> detection region in the two-dimensional image by the picture signal processing means 20. Concretely, in case that a tip of the probe 11 is adjacent to the surface of the sample 21, the scattered light generated between the probe and the sample is

observed as such a spot-like bright point 31 shown in Fig. 2A on the two-dimensional image sensor 19 placed in an image formation face. Here, by designating a range 32 (Fig. 2B) surrounding the pixels of a portion of the bright point 31 to thereby obtain a brightness of this portion in real time and by transferring it to the data collecting means 18, a data of a light intensity can be obtained simultaneously with a shape information, so that there can be realized a light probe microscope for simultaneously observing the shape picture and the two-dimensional light picture.

Paragraph beginning at line 3 of page 8 has been amended as follows:

In this manner, by designating a measuring region in agreement with the bright point, it is possible to <u>eliminate the</u> [improve a] problem [that the] <u>in which</u> excessive stray light is detected [in case that] <u>by a</u> [the] detector [whose] <u>having a</u> light-intercepting face <u>that</u> is large with respect to <u>the</u> [a] size of the bright point, and [a] <u>the</u> problem of the optical axis alignment <u>when a</u> [in case that the] detector having a small light-intercepting face in the order of the bright point is used. Particularly, in case of a micro light cantilever using a micro processing technique, it follows that an excited light is directly introduced from a back side of

the micro aperture, but in this constitution there is a case that the light leaks from a side face of the cantilever, and a system of the present invention is particularly useful in a point that only the light of the aperture portion is detected.

Paragraph beginning at line 23 of page 9 has been amended as follows:

Particularly, as shown in Figs. 4A and 4B [Fig. 4], in an observation of the spectrum, it is possible to simultaneously obtain plural light pictures by simultaneously setting plural detection regions of the spectrum. In Fig. 4A, there is shown a spectrum band 33 and, in Fig. 4B, there are shown designating ranges 34, 35, 36 surrounding a part of the spectrum band.

Paragraph beginning at line 4 of page 10 has been amended as follows:

By setting the detection region for each of plural different wavelength components in this manner, it is possible to obtain a light picture of each different wavelength component. By means of [continuously setting] varying the selected wavelength width in a wavelength direction by continuously narrowing it, it is possible to obtain a light picture for every fine wavelength component, and it is also

possible, on the basis of the light picture for every wavelength component, to perform [the] extraction of a spectral spectrum in an optional measuring point in a scanning region. By changing a size of the region of the measuring point for the extraction, it is also possible to adjust a face resolving power in the sample face of the spectrum information, an [S/M] <u>S/N</u> ratio of the spectrum itself, and the like.

<u>**IN THE CLAIMS:**</u>

Claims 1-26 have been amended as follows:

1. (Amended) A light probe microscope comprising:

a probe <u>having a tip portion and being</u> capable of generating a light field [locally existing] in a <u>vicinity of the</u> tip portion;

probe position detecting means for <u>detecting</u> [controlling] a distance between <u>the</u> [a] tip <u>portion</u> of the probe and a sample <u>surface;</u> [to an adjoining distance,]

[tremor means and] control means <u>for controlling the distance between the tip portion and the sample surface</u>;

scan means for two-dimensionally scanning the probe <u>with respect to the</u> [on a] sample surface;

a light source for generating [the locally existing] light <u>used to produce the light</u> field;

a converging optical system for converging [a] light radiated from the sample surface in response to the light field [adjoining the probe tip]; [and]

[data collecting means, wherein a two-dimensional image of the sample surface is obtained in real time by a]

a two-dimensional image sensor for producing a two-dimensional shape image of the sample surface in real time; and

picture signal processing means for producing a [by a two-dimensional image sensor, and a] two-dimensional light image in accordance with [is obtained simultaneously with a shape image by the data collecting means by means of obtaining] a signal intensity of a [an optional] detection region in the two-dimensional shape image [by picture signal processing means].

2. (Amended) A light probe microscope according to [set forth in] claim 1; further comprising a spectroscope interposed between the radiated light and the two-dimensional image sensor for selectively obtaining [, wherein] a light signal of a specified wavelength [can be selectively obtained by disposing a spectroscope in a front state of the two-dimensional image sensor].

3. (Amended) A light probe microscope according to [set forth in] claim 1; [,] wherein the converging optical system comprises [is composed of an optical system containing] a polarizer and a mirror arranged such that [, and] different polarization components of the radiated light form images [respectively] in separate positions on the two-dimensional image sensor.

4. (Amended) A light probe microscope according to [set forth in] claim 1; [,] wherein the converging optical system comprises [is composed of an optical system containing] a dichroic mirror and another [a] mirror arranged such that [, and] different wavelength components of the radiated light form images [respectively] in separate positions on the two-dimensional image sensor.

5. (Amended) A light probe microscope according to [set forth in] claim 1; wherein the picture signal processing means includes means for obtaining a signal intensity of a plurality of separate detection regions in the two-dimensional shape image and producing [, wherein the detection region can be simultaneously set in plural number, and plural] light images corresponding to the respective detection regions [can be simultaneously obtained].

6. (Amended) A light probe microscope according to [set forth in] claim 2; wherein the picture signal processing means includes means for obtaining a signal intensity of a plurality of separate detection regions in the two-dimensional shape image and producing [, wherein the detection region can be simultaneously set in plural number, and plural] light images corresponding to the respective detection regions [can be simultaneously obtained].

7. (Amended) A light probe microscope according to [set forth in] claim 3; wherein the picture signal processing means includes means for obtaining a signal intensity of a plurality of separate detection regions in the two-dimensional shape image and producing [, wherein the detection region can be simultaneously set in plural number, and plural] light images corresponding to the respective detection regions [can be simultaneously obtained].

8. (Amended) A light probe microscope according to [set forth in] claim 4; wherein the picture signal processing means includes means for obtaining a signal intensity of a plurality of separate detection regions in the two-dimensional shape image and producing [, wherein the detection region can be simultaneously set in plural number, and plural] light images corresponding to the respective detection regions [can be simultaneously obtained].

9. (Amended) A light probe microscope according to [set forth in] claim 1; [,] wherein the two-dimensional shape image is [obtained as] a video signal, and [a signal of optical picture] is updated at [by] a video rate.

10. (Amended) A light probe microscope according to [set forth in] claim 1; further comprising data collecting means for obtaining the two-dimensional shape image and the two-dimensional light image; [,] wherein [in] the picture signal processing means includes means for digitizing [,] a video signal, calculating [is digitized,] a light intensity of the detection region, and transmitting the calculated light intensity [is calculated, and it is transmitted] to the data collecting means as a digital or [value intact or by being converted into an] analog value.

11. (Amended) A light probe microscope according to [set forth in] claim 1; further comprising data collecting means for obtaining the two-dimensional shape image and the two-dimensional light image; and [, wherein it is made possible by] an external data collecting unit separate from [other than] the data collecting means for obtaining [to obtain] a picture synchronized [synchronizing] with the shape image in accordance with [by means of transmitting a] data containing a [obtaining] trigger signal output by [from] the data collecting means.

12. (Amended) A light probe microscope according to [set forth in] claim 5; [,] wherein the picture signal processing means includes means for obtaining a light image for all [every different] wavelength components of the light probe microscope [component is obtained] by setting a [the] detection region for each of the [plural different] wavelength components [in the light probe microscope].

13. (Amended) A light probe microscope according to [set forth in] claim 6; [,] wherein the picture signal processing means includes means for obtaining a light image for all [every different] wavelength components of the light probe microscope [component is obtained] by setting a [the] detection region for each of the [plural different] wavelength components [in the light probe microscope].

14. (Amended) A light probe microscope according to [set forth in] claim 7; [,] wherein the picture signal processing means includes means for obtaining a light image for all [every different] wavelength components of the light probe microscope [component is obtained] by setting a [the] detection region for each of the [plural different] wavelength components [in the light probe microscope].

15. (Amended) A light probe microscope according to [set forth in] claim 8; [,] wherein the picture signal

processing means includes means for obtaining a light image for all [every different] wavelength components of the light probe microscope [component is obtained] by setting a [the] detection region for each of the [plural different] wavelength components [in the light probe microscope].

16. (Amended) A light probe microscope according to [set forth in] claim 12; further comprising means for extracting [, wherein there is performed an extraction of] a light [spectral] spectrum from the light image at a [an optional] measuring point in a scan region of the sample for plural [on the basis of the light image for the every] wavelength components by [component] continuously varying the spectrum [set] in a wavelength axis direction.

17. (Amended) A light probe microscope according to [set forth in] claim 13; further comprising means for extracting [, wherein there is performed] an extraction of] a light [spectral] spectrum from the light image at a [an optional] measuring point in a scan region of the sample for plural [on the basis of the light image for the every] wavelength components by [component] continuously varying the spectrum [set] in a wavelength axis direction.

18. (Amended) A light probe microscope according to [set forth in] claim 14; further comprising means for

extracting [, wherein there is performed an extraction of] a light [spectral] from the light image [spectrum] at a [an optional] measuring point in a scan region of the sample for plural [on the basis of the light image for the every] wavelength components by [component] continuously varying the spectrum [set] in a wavelength axis direction.

19. (Amended) A light probe microscope according to [set forth in] claim 15; further comprising means for extracting [, wherein there is performed an extraction of] a light [spectral] spectrum from the light image at a [an optional] measuring point in a scan region of the sample for plural [on the basis of the light image for the every] wavelength components by [component] continuously varying the spectrum [set] in a wavelength axis direction.

20. (Amended) A light probe microscope according to claim 5; further comprising a [, wherein by means of setting by the] spectroscope for setting a wavelength of excited light at the probe tip [so as to become] outside an image region of the two-dimensional image sensor so that [,] an S/N ratio to [of] a wavelength [signal] other than the excited light is improved.

21. (Amended) A light probe microscope according to claim 6; further comprising a [, wherein by means of setting

by the] spectroscope for setting a wavelength of excited light at the probe tip [so as to become] outside an image region of the two-dimensional image sensor so that [,] an S/N ratio to [of] a wavelength [signal] other than the excited light is improved.

22. (Amended) A light probe microscope according to claim 7; further comprising a [, wherein by means of setting by the] spectroscope for setting a wavelength of excited light at the probe tip [so as to become] outside an image region of the two-dimensional image sensor so that [,] an S/N ratio to [of] a wavelength [signal] other than the excited light is improved.

23. (Amended) A light probe microscope according to claim 8; further comprising a [, wherein by means of setting by the] spectroscope for setting a wavelength of excited light at the probe tip [so as to become] outside an image region of the two-dimensional image sensor so that [,] an S/N ratio to [of] a wavelength [signal] other than the excited light is improved.

24. (Amended) A light probe microscope according to [set forth in] claim 1; [,] wherein the converging optical system is arranged to converge one of [converges a] light that has been [having] transmitted through the sample or [a light] reflected by the sample.

25. (Amended) A light probe microscope according to [set forth in] claim 1; [,] wherein the converging optical system is arranged to converge [converges a] light that has [having] passed through an optical aperture of the probe.

26. (Amended) A light probe microscope according to [set forth in] claim 1; [,] wherein an image at a selected [of a selective range] portion of the two-dimensional image sensor is continuously preserved in accordance with a [as it is synchronously with the] trigger signal.

FIG. 1

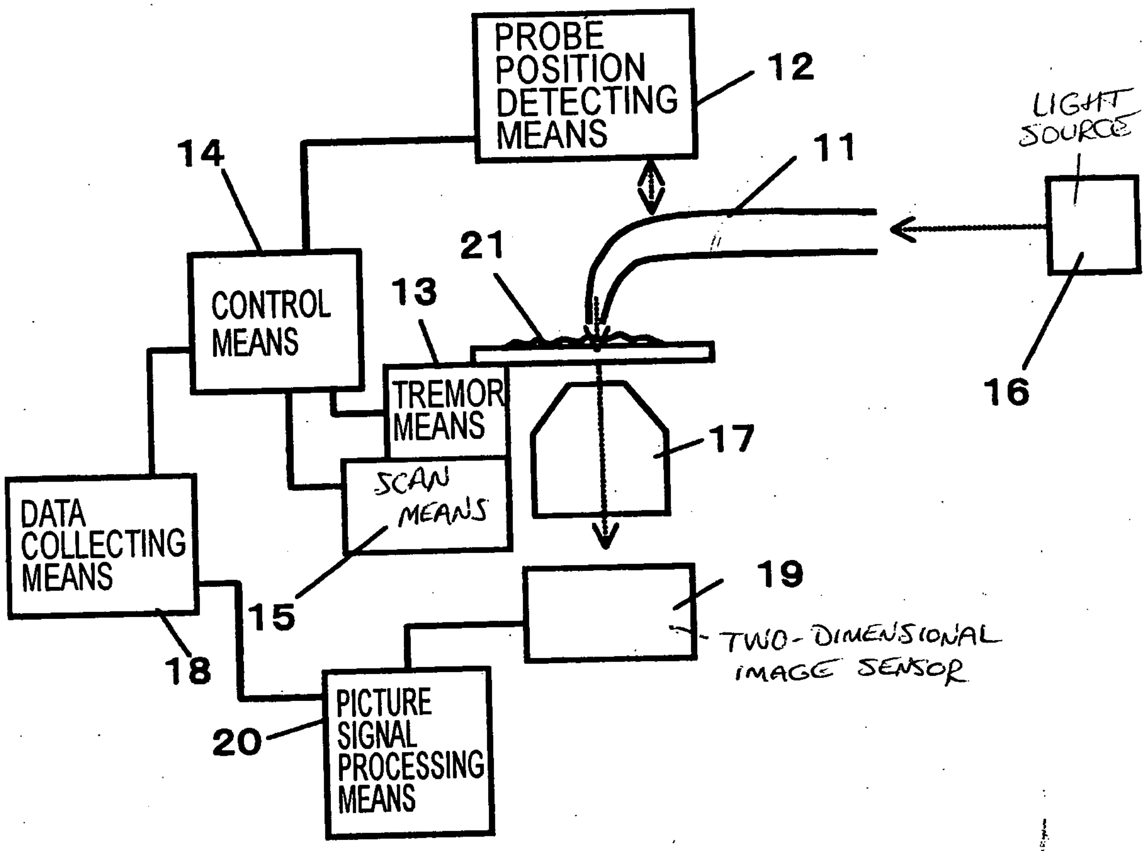


FIG. 2A

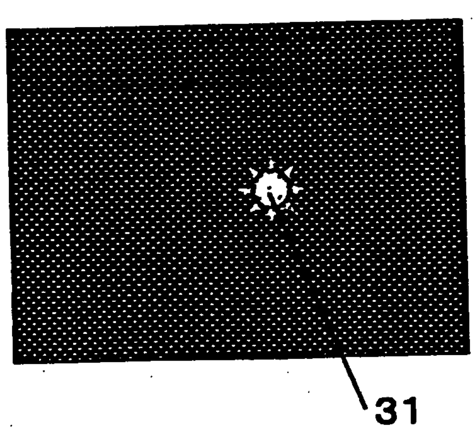


FIG. 2B

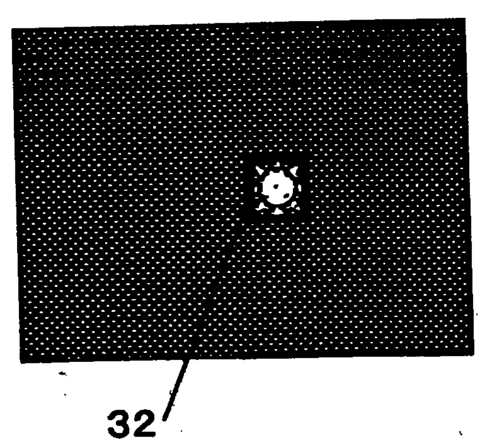


FIG. 3

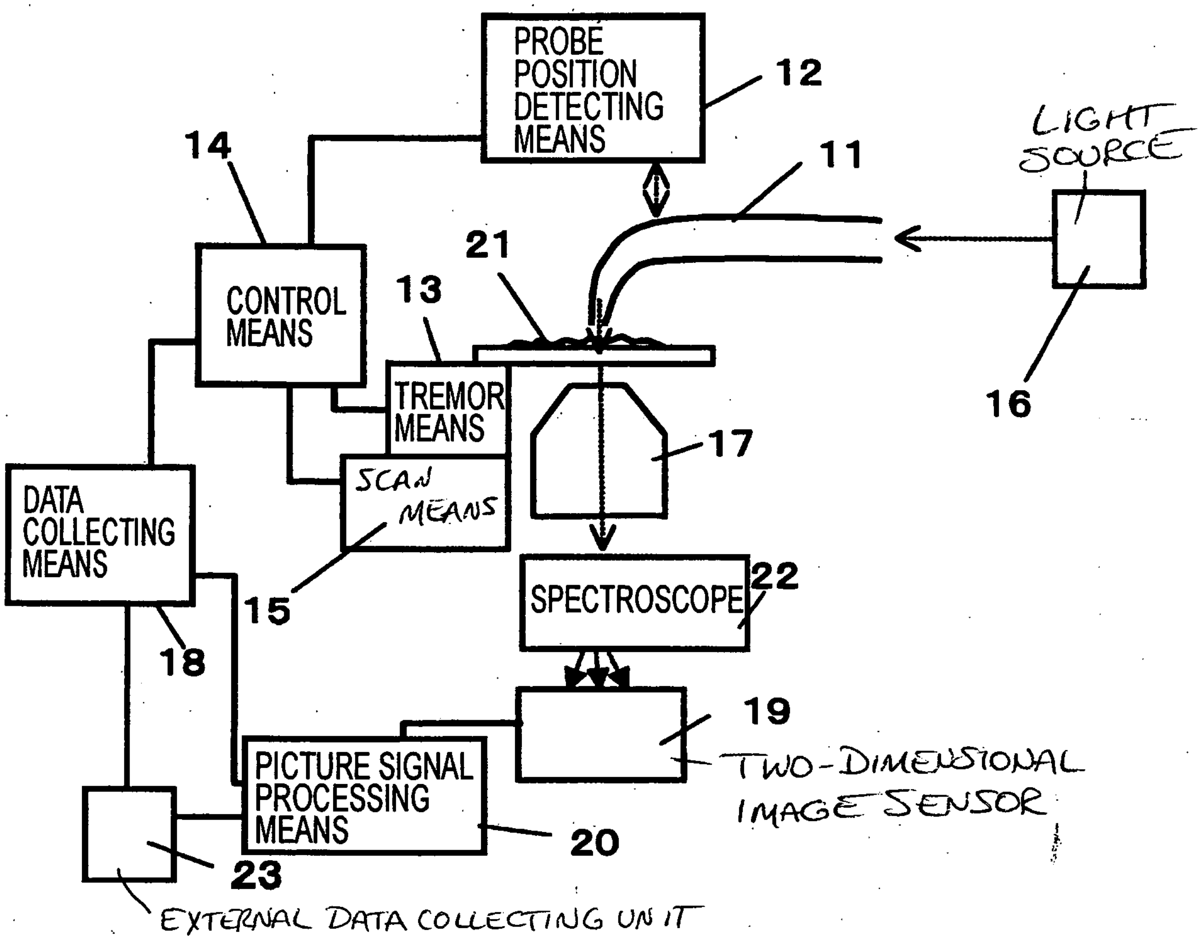


FIG. 4A

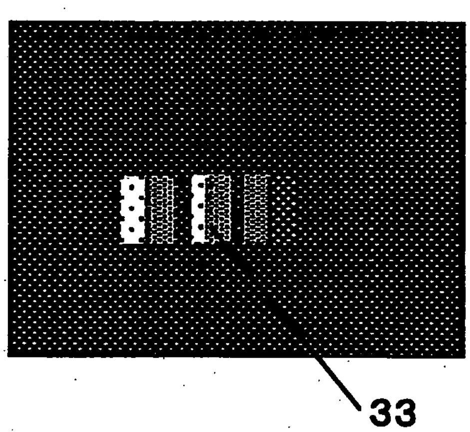


FIG. 4B

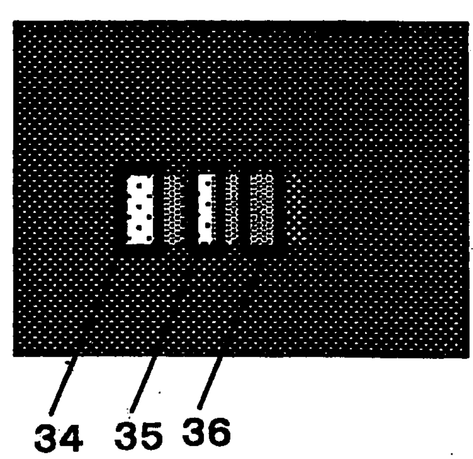


FIG. 9

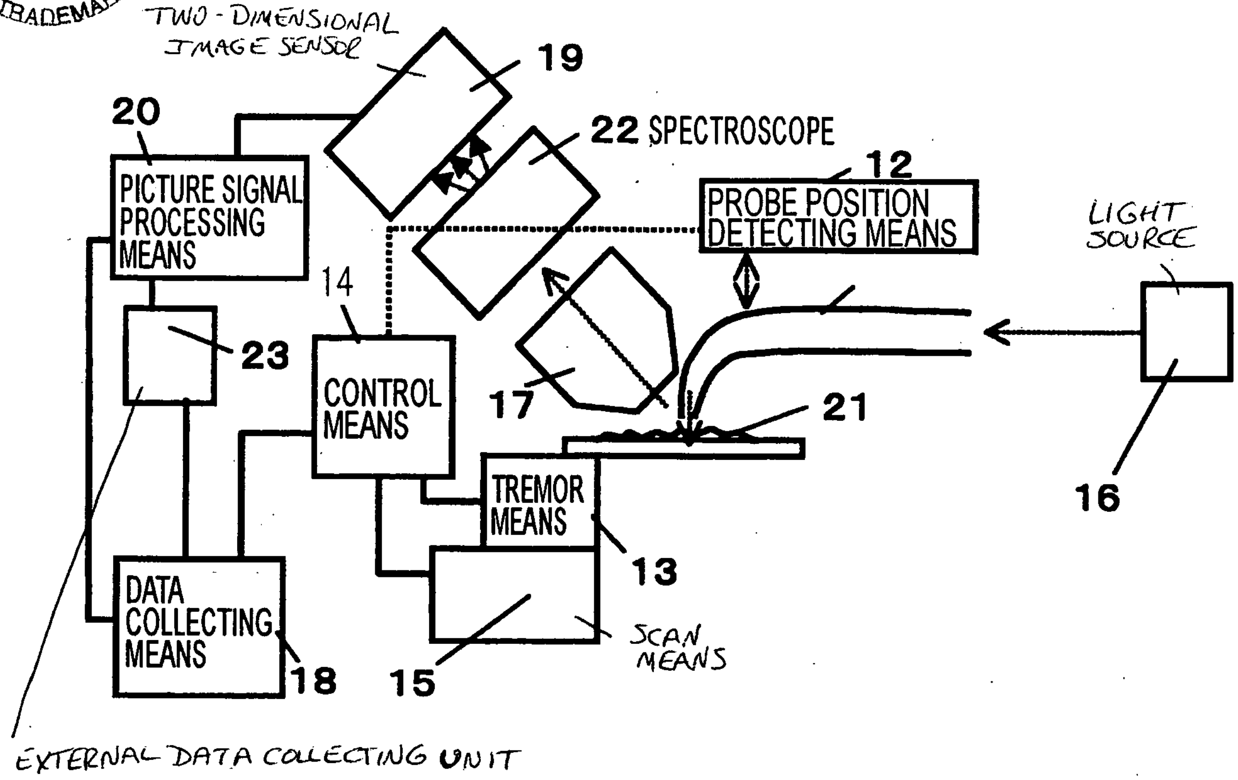
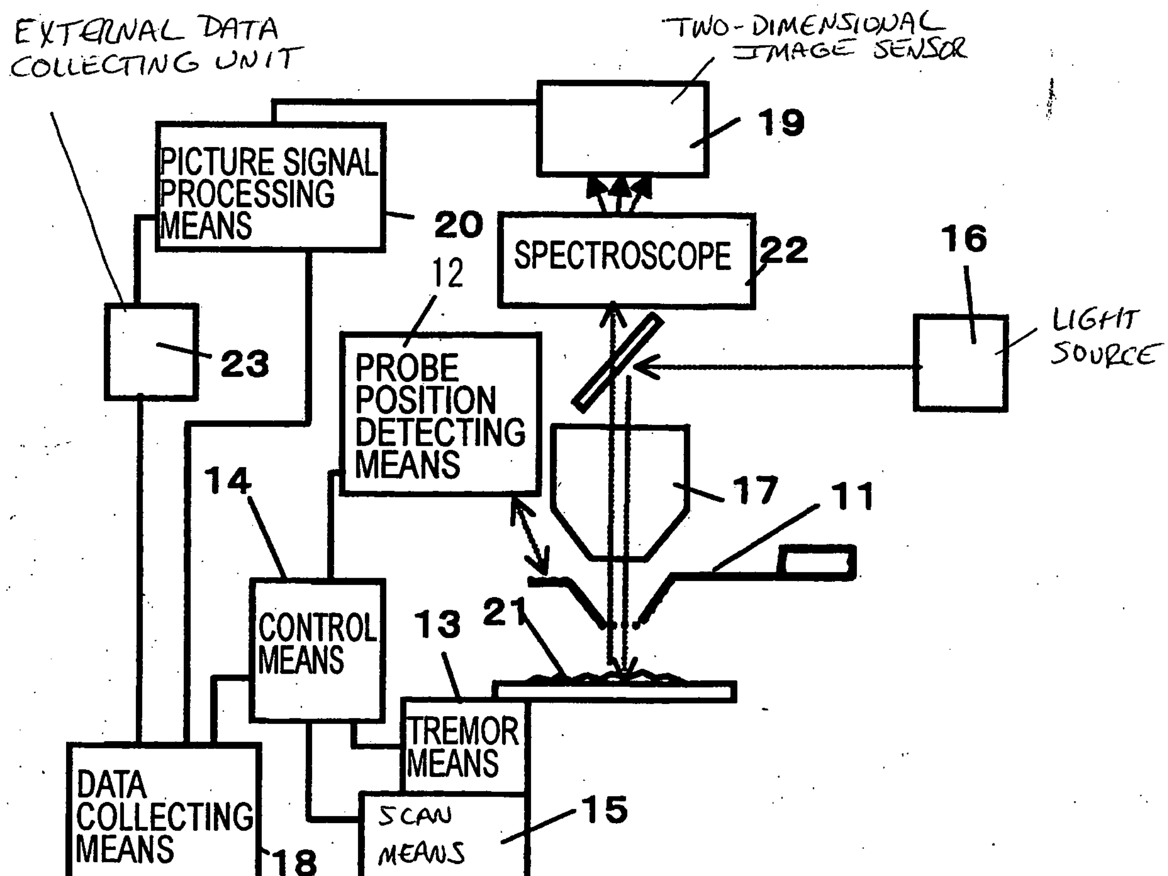

TWO-DIMENSIONAL IMAGE SENSOR
19
20
22 SPECTROSCOPE
12
PICTURE SIGNAL PROCESSING MEANS
PROBE POSITION DETECTING MEANS
LIGHT SOURCE
14
23
CONTROL MEANS
17
21
TREMOR MEANS
16
13
DATA COLLECTING MEANS
SCAN MEANS
18
15
EXTERNAL DATA COLLECTING UNIT

FIG. 10


EXTERNAL DATA COLLECTING UNIT
TWO-DIMENSIONAL IMAGE SENSOR
19
PICTURE SIGNAL PROCESSING MEANS
20
SPECTROSCOPE
22
16
12
LIGHT SOURCE
23
PROBE POSITION DETECTING MEANS
14
17
11
CONTROL MEANS
13
21
TREMOR MEANS
DATA COLLECTING MEANS
SCAN MEANS
15
18